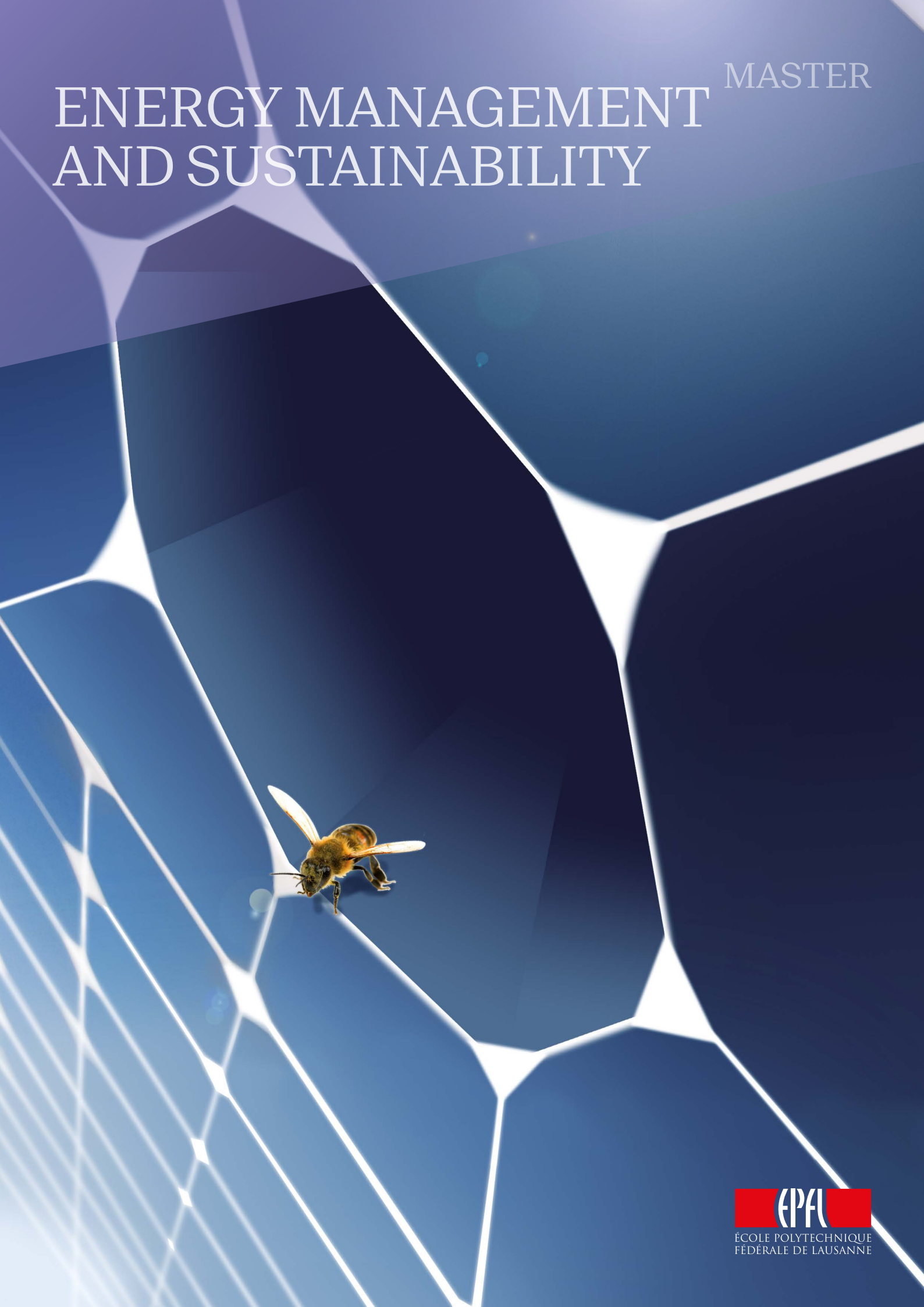
MASTER

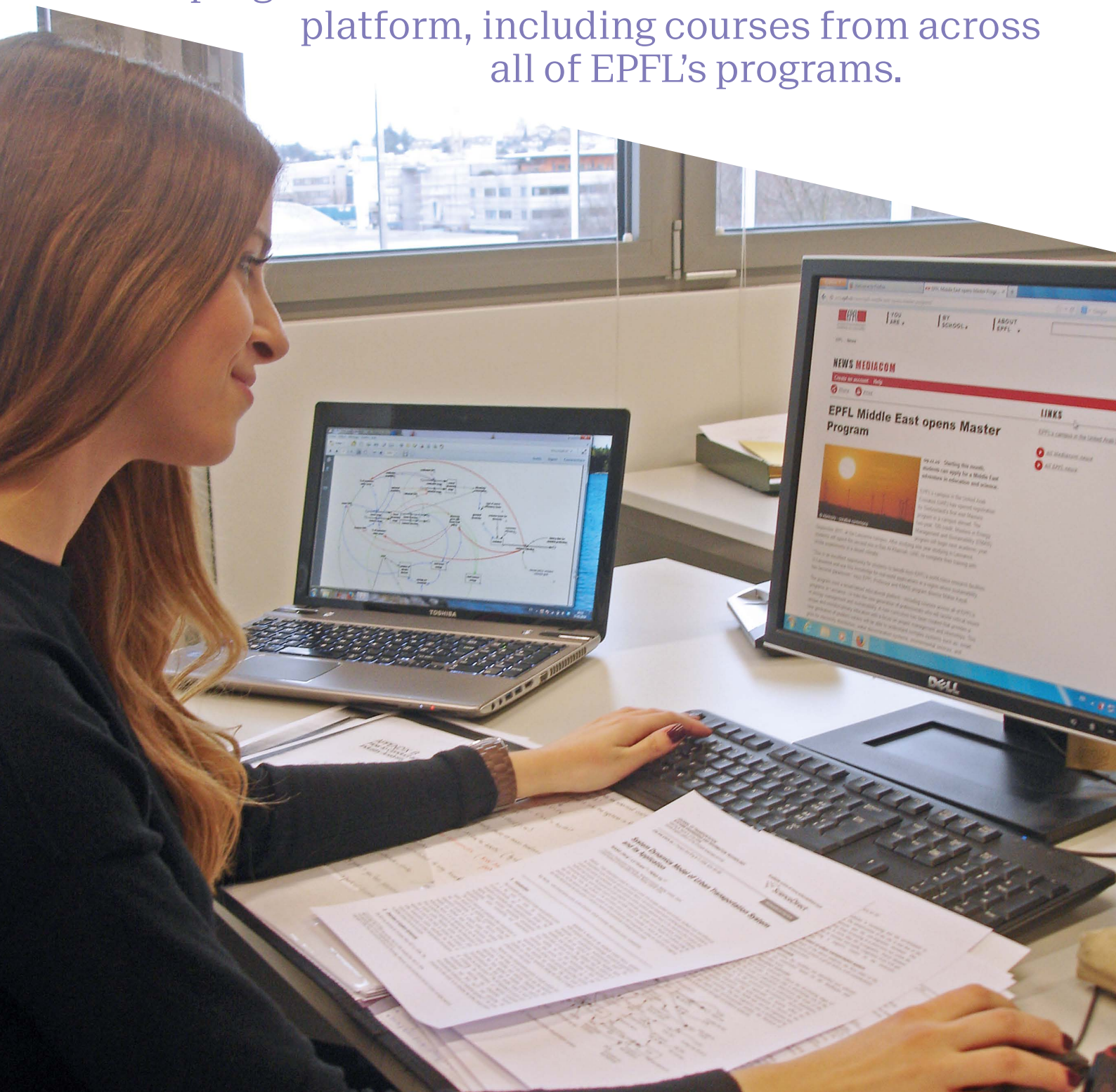
ENERGY MANAGEMENT AND SUSTAINABILITY



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

The Energy Management and Sustainability (MES) degree is built around a unique interdisciplinary curriculum that is fully geared towards preparing students to achieve lasting advances in a world where the issue of sustainability has become paramount. Students receive theoretical and practical training, using a state-of-the-art environmental and sustainable research and development framework.

The program uses a broad-based educational platform, including courses from across all of EPFL's programs.



Toward Assessing the Sensitivity of Buildings to Changes in Climate

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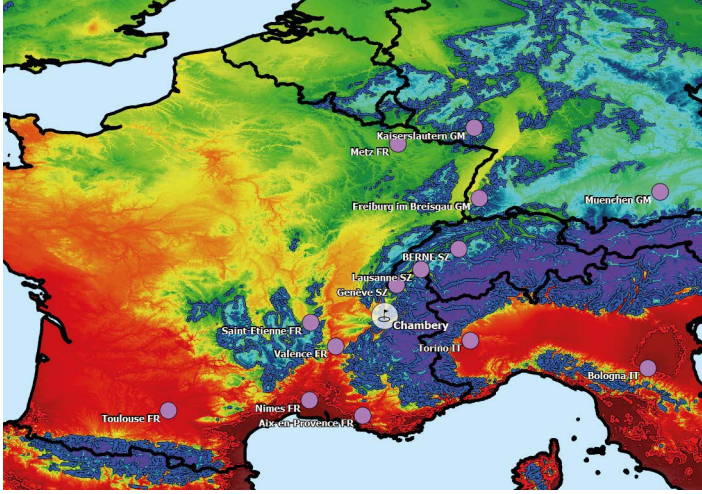
Semester project - winter and spring 2012/2013



The graphic illustrates the "temperature contour lines" drawn around a test location to determine candidate locations for simulating a changing climate.

Substantial numbers of existing and new buildings are expected to survive long enough to experience perceptible shifts in climate. To predict a building's response to changes in typical weather, two inputs are required: weather data representing this change, and suitable metrics to compare building performance across different climate normals. This paper presents initial work on a proposed method for assessing the sensitivity of new or existing buildings to climate change. This method begins with a selection of weather files to represent climate change, then quantities a building's passive performance in those climates using an enthalpy-based metric, and ends with a graphical analysis of the performance of the building in different climates to assess its robustness. We propose an objective performance metric based on the extent to which a building creates indoor conditions passively, i.e. without auxiliary systems. Initial work suggests that the performance assessment carried out here is reproducible and applicable for indoor environment design and evaluation in different ranges of climate change. This approach enables a comparison of building performance without the bias introduced by inherent differences in climatic conditions.

Cecilia Andrade:
"We have to rethink the way to produce and manage energy."

Watch the video:

Hamed Ziadé :
"I wanted to create a link between Civil Engineering and Environmental Engineering, in order to protect the environment and go sustainable."

Renewable energy breakthrough into refugee camps.

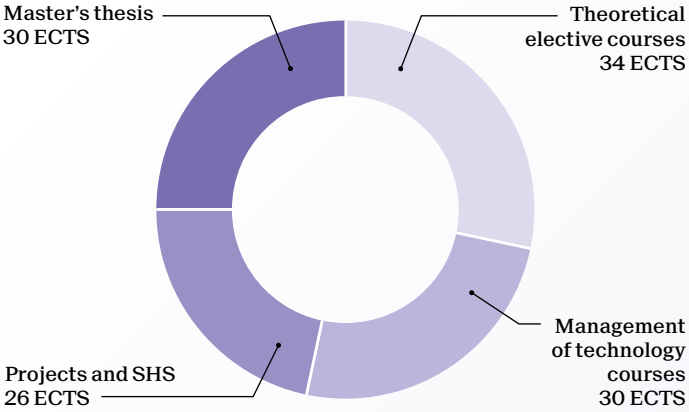
This project was carried out in collaboration with the United Nations' Refugee Agency (UNHCR-Geneva). Student: Hamed Ziade, Supervisor: Prof. Maher Kayal, Master's Thesis, Spring semester 2013.

Given the urgency and the opportunities presented by the issue of energy, the aim of this master's project was to develop a tool that could be easily used by UNHCR field officers to calculate the power and energy budget inside refugee camps.
Based on calculated power consumption budgets, Hamed Ziade designed innovative and affordable renewable energy solutions and smart power management infrastructure that can be incorporated in camp settings. His results show the importance of optimizing power generation inside camps and how UNHCR can benefit from innovations in the field of renewable and smart energy, by lowering the cost of electricity generation at the camp level, as well as carbon dioxide emissions. Additionally, these solutions could improve the status of the individuals inside the camps and secure better living conditions for refugee communities. Savings in energy costs would also help UNHCR to deliver more goods, such as water and foods, and expand the radius of services to those in need.
This Master's project brings a completely new research area into the humanitarian sector, applying engineering knowledge in an extremely complex and challenging field, while prioritizing the various aspects of sustainable development of energy management within refugee camps.

Master of Science in

ENERGY MANAGEMENT AND SUSTAINABILITY

2-year program - 120 ECTS



This program includes a minimum 8-week compulsory internship in industry.

Research

Research activities focuse on the following areas:

- Structural wind engineering
- Energy
- Water resources
- Urban design and environment
- Transportation

Professional outlook

This new project-focused curriculum is built on scientific rigor and professional practice, to provide a unique, interdisciplinary training in energy management and sustainability. The new generation of problem solvers will be able to understand complex systems such as smart grids for electricity distribution, water dissemination systems, environmental services and electronic networks that control energy consumption. And ultimately, to be able to both maximize their efficient use and minimize their negative impact on society.

Curriculum

Strong emphasis will be placed on dealing with engineering tasks, taking into consideration important technical, economical, environmental, safety and social constraints. Students will also gain valuable skills in project management.
Multidisciplinary projects are proposed at the beginning of the program, and a tutor is assigned for each project. Students will work in a team to address these projects. An industrial internship will provide practical experience in a professional setting.
The elective subjects are to be chosen in the course catalogue of the EPFL School of Engineering and School of Architecture, Civil and Environmental Engineering.

Entry requirements

Candidates should hold a Bachelor's degree in Engineering or Applied Physics.

Career prospects

Graduates from the MES program form a new and unique generation of professionals who will be called upon to tackle critical issues in energy management and sustainability. They are distinguished by their technical and management knowledge and the skills required to deal with a wide range of issues at the interface between energy, technology, and business. At the beginning of their career, they can be hired by any company that deals with energy; in project management, R&D, innovation management, and project development. The first batch of graduates have been hired by companies such as ABB, BKW, public and non-governmental organizations, and consulting companies, and some have even launched their own start-up in the UAE.

master.epfl.ch/energy
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	Credits
Theoretical elective courses	**34**
Chemical and Environmental Bioprocess	
Air pollution and climate change	5
Applied wastewater engineering	3
Energy conversion and renewable energy	3
Fate and behaviour of environmental contaminants	4
Groundwater and soil remediation	4
Sanitary engineering in developing countries	2
Solid waste engineering	4
Water and wastewater treatment	5
Natural Water, Soil and Ecosystems Engineering	
Environmental Transport phenomena	5
Urban hydraulic systems	3
Water quality modeling	4
Water resources engineering	5
Monitoring and Modeling of the Environment	
Distributed information systems	4
Distributed intelligent systems	5
Fundamentals of traffic operations and control	3
Geomonitoring	5
Introduction to database system	4
Sensor orientation	4
Spatial statistics and analysis	5
Sustainability assessment of urban systems	3
Energy	
Advanced control systems	3
Advanced energetics	5
Building energetics	3
Energy storage systems	3
Engines and fuel cells	4
Fracture mechanics	3
Fundamentals and processes for photovoltaic devices	3
Hydraulic turbomachines	4
Hydrodynamics	5
Hydropower plants: generating and pumping units	2
Industrial electronics I, II	8
Instability	3
Large-area electronics: devices and materials	3
Materials selection	2
Modélisation des systèmes énergétiques	3
Modelling and optimization of energy systems	4
Numerical flow simulation	5
Power system restructuring and deregulation	3
Power systems dynamics	3
Production management	5
Smart grids technologies	5
Thermal power cycles and heat pump systems	2
Turbulence	3
Two-phase flows and heat transfer	3
Material and energy flow analysis	4
Various other domains	
Advanced fossil and renewable energy systems	4
Advanced machine learning	4
Analyse et management des risques industriels	3
Commande embarquée de moteurs	2
Catalysis for energy storage	2
Commande non linéaire	3
Études d'impact	3
Habitat et développement urbain	3
Intelligent agents	6
Mathematical modelling of behavior	5
Model predictive control	3
Planification intégrée des infrastructures d'énergie	3
Process development I, II	4
Real-time networks	3
Recycling of materials	2
System identification	3
Management of technology courses	**30**
Management of technology courses	
Projects and SHS	**26**
Project in energy management and sustainability I, II	20
Project in human and social sciences	6